# 3.5 ENERGY AND NATURAL RESOURCES

This section discusses energy and natural resources in and near the proposed Plymouth Generating Facility (PGF) site area and the natural resources that would serve the PGF during construction and operation. Impacts of the demand for energy and natural resources attributable to the PGF on the supply of resources are assessed. Types of energy and natural resources discussed include electricity, natural gas, water, and land.

## 3.5.1 AFFECTED ENVIRONMENT

Energy and natural resources are not currently utilized onsite because no development is present at the plant site. The land within the site boundaries is currently not in productive use. Electricity and natural gas are not supplied to the plant site, although each type of resource is available nearby.

See Section 3.12, Public Services and Utilities, for additional information about existing electricity and water near the plant site. Also, Section 3.3 discusses water resources in greater detail.

As stated in Section 3.12, Public Services and Utilities, Williams Northwest Gas Pipeline Company (Williams Co.) operates and maintains a natural gas pipeline system that runs through Benton County. The site area is within the service area of Cascade Natural Gas Corporation, which provides local natural gas distribution facilities in Benton County.

In 2000, proven natural gas reserves were approximately 167 trillion cubic feet (tcf) in the U.S. and 63 tcf in Canada (EIA 2001b). Historically, estimates of reserves have grown over time primarily due to changing (increasing) estimates of reserves in fields that have already been discovered. During the period 1978 to 1993, reserves grew approximately 60 percent per year (USGS 1997).

Natural gas production in the U.S. is expected to increase from 21 tcf in 2001 to approximately 27 tcf by 2015, and to 28.5 tcf by 2020 (Tinker and Kim 2002; EIA 2002). Since energy use in general is moving away from coal and oil toward natural gas and hydrogen, demand for natural gas will likely increase in the next few decades. Net imports of natural gas from Canada are projected to increase from 3.5 to 5.5 tcf between 2000 and 2020 (EIA 2002).

## 3.5.2 ENVIRONMENTAL CONSEQUENCES

The impact analysis involved comparing existing energy and natural resource supplies to energy and natural resource needs of the PGF, for both construction and operation. A depletion of energy and resources supply up to 1.5 percent would be considered a low impact. A moderate impact would be an energy and resource depletion between 1.5 and 5 percent, and a high (significant) impact would result if the depletion would be over 5 percent. Where quantities are not available, impacts are rated qualitatively.

### 3.5.2.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be constructed. No impacts attributable to the Proposed Action on energy and natural resources would result.

### 3.5.2.2 Proposed Action

The PGF would consume energy and natural resources directly and indirectly during construction and operation. Direct consumption would involve the use of natural gas as fuel for generating electricity during project operation. Energy would be indirectly expended by equipment and vehicles due to PGF construction and maintenance. When operating, the PGF would generate electrical energy at a rate many times greater than the rate at which electrical energy would be consumed.

#### *3.5.2.2.1 Construction*

The PGF would be constructed using a variety of materials that require energy for fabrication. Energy would be required to transport these materials to the plant site and then to erect or install them. Additional energy, in the form of electricity, gasoline, and diesel fuel, would be consumed by cranes, trucks, mobile equipment, tools, and equipment operated in the actual construction of the facility.

The amount of natural resources used in the construction of a project such as the PGF would be very small. The largest quantities would be steel (coming from iron ore) and concrete (coming from aggregate, sand, and cement quarries and pits).

Average expected electricity demand during construction would be no more than 500 kilowatts (kW) at 480 volts during the expected 40 hours per week of construction activity. Electricity use during non-working hours would consist primarily of lighting for security purposes. If the electric distribution capacity is unavailable, the loss of electric service could be replaced through the use of self-contained construction equipment such as engine driven welders and electric generators. A short-term requirement for up to 5 MW of electrical energy would be required during plant testing and commissioning.

As stated in Section 3.12, Public Service and Utilities, the Benton County Rural Electric Association (REA) would provide electricity to the plant site during construction, and impacts to electrical capacity during construction would be minimal. Natural gas would not be used during PGF construction, so no impacts to natural gas suppliers would result attributable to PGF construction.

As stated in Section 3.3, Water, construction of the PGF would result in low impacts to the water supply in the area. (See Section 3.3 for more information.) The plant site land and the land used for the laydown area necessary for construction would not constitute a significant decrease in the amount of land available for other uses in the area. (See Section 3.8, Land Use, for further information.)

### *3.5.2.2.2 Operation*

Resources consumed during PGF operation would include natural gas, water, and electricity during startup. A minor amount of various metals, petroleum-based lubricants, paints, and selected chemicals would be consumed as the plant is operated, maintained, and regularly overhauled.

#### Natural Gas and Electricity

The PGF would be a natural gas-fired, combined cycle facility including one natural gas combustion turbine generator, one heat recovery steam generator (HRSG), and one steam turbine generator. The combustion turbine would discharge hot exhaust gases to the HRSG for the production of steam for use in the steam turbine. The nominal capacity of the facility would be 307 megawatts (MW).

The combined system would operate at a nominal 53 percent efficiency, at least 20 percent higher than conventional power plants that use a solid-fueled boiler and steam turbine on an equivalent basis. On a comparative basis, energy conversion efficiency is increased by using a facility configured like the PGF, and natural gas use is less. Table 3.5-1 shows the net amount of energy that would be consumed by the PGF on an annual basis. This includes the offsite export of the equivalent of 8,919,000 million British thermal units (MMBtu)/year as electrical energy.

**Table 3.5-1**
**Estimated Net Energy Consumption**
**(Based on Average Ambient Conditions)**

| Energy Type | Estimated Energy (MMBtu/year) |
|---|---|
| Natural Gas Consumed | 16,820,000 |
| Electrical Energy Produced (exported) | 8,919,000 |
| Net Energy Consumption | 7,907,000 |

Source: NESCO 2002.

PGF would supply its own power needs when operating. Startup power would be supplied by BPA. Benton REA would provide an estimated 2 MW of standby power for times when the plant is out of service for maintenance or other reasons. There would also be an emergency diesel generator on site.

PGF would be interconnected to the BPA electric grid 0.6 mile north of the plant site. At a 97 percent capacity factor, the PGF would generate approximately 2.6 million MW hours of electricity annually and approximately 78.3 million MW hours of electricity over a 30-year operational life. The plant would have low and, therefore, less than significant impacts on electrical capacity during startup and down time, and would be a net exporter of electricity for the BPA transmission grid when in operation.

Natural gas would be the PGF's only fuel and would be delivered by the Williams Company. Plymouth Energy would enter into gas supply contracts with one or more suppliers and/or marketers who have offered to sell gas. To provide security in fuel supply, Plymouth Energy could also acquire an ownership interest in natural gas reserves to provide a portion of the supply to the plant. A portion of the gas supply could also be purchased on the short-term market.

Natural gas could be purchased from Canadian and U.S. reserves in the Midwest and Texas. The maximum total estimated gas reserves required for the PGF over a 30-year operational life equals approximately 530.04 x $10^6$ thousand cubic feet, or approximately 0.530 trillion cubic feet (tcf), which is 0.018 tcf per year on average. Annual gas consumption by the PGF represents approximately 0.01 percent of total reserves in the U.S. in 2001 and approximately 0.08 percent of U.S. gas production in 2001. Both production and reserves are expected to grow. Gas consumption due to PGF operation would represent a low-level depletion of or impact on natural gas supplies, and therefore a less than significant impact.

#### Water

The PGF would require a maximum of 1,100 acre-feet of water per year. Approximately 960 acre-feet would be obtained from the Plymouth Energy-purchased water right. The remaining 140 acre-feet would be leased from Plymouth Farm. The water would be used to dissipate heat in the operation of the facility, meet makeup requirements of the steam cycle, and provide general process consumption requirements (see Section 3.3 for a discussion of water supply).

As stated in Section 3.12, Public Services and Utilities, the PGF would not require water from the local Plymouth Water District, so there would be no impacts to the local water supply.

#### Materials and Commodities

It is expected that approximately 20,000 cubic yards of bulk construction materials (such as soil, aggregate, gravel, and sand) would be required. Material not available on site would be supplied from local sources. Other building materials, equipment, diesel fuel for the emergency generator, and other operational commodities would be purchased from equipment and material suppliers.

### *3.5.2.2.3 Conservation and Renewable Resources*

Power generated from the PGF would be sold under long-term and short-term energy contracts. Because it is easily dispatchable (i.e., can start and stop fairly easily), the power generated from the PGF can be sold as a back-up resource for generators with renewable resources such as hydro- and wind-generated power that can have an uncertain "fuel" supply. Plymouth Energy anticipates that the PGF might not generate power during periods of extremely low market prices such as during the spring high water run-off period, when hydro-based generation is typically plentiful and inexpensive.

The PGF would use natural gas, a nonrenewable resource. Due to its state-of-the-art combustion turbine combined-cycle generating unit. The PGF's primary advantage when compared to other fossil fuel fired-generating resources is that it would generate electricity more efficiently. It would take fewer Btu's (energy) to generate a kilowatt-hour (kWh) of electricity in a combined cycle

facility (6,000 to 6,700 Btu/net kWh) than in other types of fossil-fueled generating facilities (9,000 to 11,000 Btu/kWh for coal plants; 10,000 to 12,000 Btu/kWh for simple cycle combustion turbines). To the extent fossil fuels are used, particularly natural gas, they would be conserved because combined cycle plants are the most efficient fossil-fueled power generation systems currently available. Existing combined cycle plants operate at thermal efficiencies greater than 44 percent. The PGF would operate nominally at 53 percent efficiency at average ambient temperatures.

### 3.5.3 CUMULATIVE IMPACTS

The other natural gas-fired projects (listed below) located in the mid-Columbia River region are in review, approved but not constructed, or under construction. The combination of these projects with the PGF could result in cumulative impacts because the PGF and the following projects would rely on natural gas for fuel.

- Goldendale Energy Project, Goldendale, Washington
- Coyote Springs – Unit 2, Morrow County, Oregon
- Grizzly Power Project, Jefferson County, Oregon
- Hermiston Power Project, Umatilla County, Oregon
- Umatilla Generating Project, Umatilla County, Oregon
- Morrow Generating Project, Morrow County, Oregon
- Wallula, Walla Walla County, Washington
- Wanapa Energy Center, Umatilla County, Oregon

Natural gas for the PGF would be acquired in three ways: (1) long-term contracts with suppliers, (2) acquired ownership by Plymouth Energy in reserves, or (3) purchase on the short-term market. As noted in the Natural Gas discussion in the previous section, Canadian and U.S. gas reserves are adequate to supply the PGF over the life of the PGF. If the PGF and all of these other projects were built and operated at maximum capacity, total annual production would be approximately 5,961 MW, of which the PGF represents approximately 5.2 percent. In terms of natural gas supply and demand, the projects (the PGF and those listed above) would require approximately 10.291 tcf over 30 years of operation, which represents approximately 6.2 percent of U.S. natural gas reserves in 2000. The criterion used for the PGF was that an impact would be considered significant if the natural gas requirements were anticipated to be over 5 percent of supply. Considering that the PGF would be 307 MW, and the projects analyzed in the cumulative impacts analysis total 5,961 MW, an appropriate criterion (percentage) for determining significance of impacts for the cumulative impact analysis would be several times greater than 5 percent. Therefore, since the natural gas requirement of these cumulative projects would be 6.2 percent of supply, the impact is not considered significant.

### 3.5.4 SUMMARY OF IMPACTS

Impacts on energy and natural resources attributable to the proposed project would be low and, therefore, less than significant.

## 3.5.5 MITIGATION

No significant adverse impacts are anticipated to occur to energy or natural resources. Therefore, no mitigation measures will be required.

## 3.5.6 REFERENCES

Energy Information Administration (EIA). 2001. Department of Energy, Energy Administration Information. World Energy Data, Natural Gas Reserves. Table 8.1 Crude Oil and Natural Gas Reserves, January 1, 2000. Available at <http://www.eia.doe.gov/fueloverview.html>.

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